

# Clinical Investigation

## Evaluation of Impotence in Older Men

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*Careful evaluation was carried out in 93 men older than 50 with erectile dysfunction. Their mean age was 61 years and the disorder had been present for a mean of 4.5 years. While 14 men (15%) had psychosocial factors that may have been pertinent, only 2 scored poorly on an Affect Balance Scale and 3 were receiving psychoactive medications. Results of nocturnal penile tumescence were abnormal in 91%. In 39% penile-brachial pressure indices were suggestive of pelvic vascular disease and in 9% were consistent with a pelvic "steal syndrome." Pelvic or peripheral nerve conduction disorders were also commonly seen in 54%. Endocrinopathy may have contributed to the dysfunction in 35%. Twenty-one men had diabetes mellitus, two new cases of hypothyroidism were discovered and hypogonadism was diagnosed definitely in four and considered likely in five others. Coexisting medical conditions were found in more than 90% of the men, especially hypertension, use of antihypertensive medications and atherosclerotic disease. Previous prostatectomies (19%) and vasectomies (30%) were common in the surgical histories.*

*Given the wide range of disorders uncovered in older men complaining of impotence, diagnostic study of potential causes may lead to a more rational approach for the evaluation and management of these men.*

(Davis SS, Viosca SP, Guralnik M, et al: Evaluation of impotence in older men [Clinical Investigation]. West J Med 1985 Apr; 142:499-505)

Contemporary emphasis on fitness and quality of life has led to increased expectations regarding sexual performance among aging couples. Despite a wide variation among persons, a pronounced decline in male sexual activity with age has been shown to occur.<sup>1-5</sup> While Kinsey's initial observations that erectile dysfunction increased from 28% at age 60 to about 50% by age 75 were made long ago,<sup>1</sup> only now are large numbers of older men seeking medical evaluation and treatment for impotence. In a recent survey of impotence among US veterans presenting at another Veterans Administration hospital, Slag and co-workers found a prevalence of 34% among men with a mean age of 62 years, and more than half of these said they would be interested in further investigation of their problem.<sup>6</sup>

Professional interest in sexual dysfunction broadened as it was realized that older men might have organic disorders as the major cause of impotence.<sup>6-10</sup> A high incidence of thera-

peutic drug use, vascular and neurologic disease and diabetes was found in sexually dysfunctional older men. Testosterone levels were usually in the normal range but some low values were seen. Thus, the traditional position that impotence is usually psychogenic<sup>11</sup> was not tenable in these men.

It was the objective of this study to comprehensively evaluate the factors that may contribute to the relatively common complaint of impotence in middle-aged and elderly men and to analyze the relation between reproductive hormonal measurements and the other underlying organic problems.

### Subjects and Methods

Ninety-three veterans older than 50 were evaluated in the Sexual Dysfunction Clinic. The men were self-referred or sent by their primary physicians for evaluation and met the criteria of age over 50 years and no known alcoholism, uremia or advanced carcinoma. They had no previous diag-

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## ABBREVIATIONS USED IN TEXT

NPT=nocturnal penile tumescence  
 SHBG=sex hormone-binding globulin  
 SD=standard deviation

nosis of Klinefelter's syndrome or other hypogonadal state. They all suffered erectile dysfunction—that is, failure to obtain and maintain adequate penile erection for intromission and coital orgasm.

The subjects were questioned about the characteristics of their sexual problem, their medical and surgical histories and all alcohol, medications or recreational drugs used. The time and rate of onset of the impotence, presence of morning erections, masturbatory function, uniformity versus selectivity of the disturbance, patient's and partner's attitude toward the problem, level of libido, quality of life-style, sexual relationships and subject's mood were assessed in interview and by using the Derogatis Sexual Function Inventory.<sup>12</sup> The ease of attaining, firmness and duration of erections, as well as the quantity of ejaculate and quality of orgasm, were elicited to determine the nature of the sexual dysfunction. Physical examination and general laboratory tests were carried out, including fasting glucose studies and tests of liver, renal and thyroid function.

Reproductive endocrine evaluation included blood sampling on three separate mornings (between 8 and 10 AM) for the measurement of testosterone, estradiol, estrone, luteinizing hormone, follicle-stimulating hormone by radioimmunoassay,<sup>13</sup> prolactin determined by radioimmunoassay technique with a rabbit antiserum to purified human pituitary prolactin (supplied by Radioassay Systems Laboratories, Inc), sex hormone-binding globulin (SHBG) capacity by dihydrotestosterone saturation and precipitation by ammonium sulfate modified from Rosner,<sup>14</sup> calculation of free testosterone by equilibrium dialysis<sup>15</sup> and free estradiol, utilizing precipitation of SHBG at 50% ammonium sulfate.<sup>16</sup>

Objective documentation of erectile function was obtained utilizing nocturnal penile tumescence (NPT) recording, of systolic pressure in the penile arteries by Doppler measurements and of pelvic and peripheral nerve function by electromyographic recording. While resources were available 11 subjects were admitted for two to three nights and NPT was monitored by electroencephalograph with a penile mercury strain gauge around the penile base and tip (registering both circumference change and duration of events) to observe whether they attained episodes of full penile tumescence normally seen during sleep.<sup>17</sup> They were awakened during the best tumescent event for assessment by the patient and a trained observer of rigidity and adequacy for vaginal penetration. Fifty-nine subjects used a Dacomed Snap-Gauge at home for two to four nights, which offers a measure of stiffness as well as circumference change. The snap-gauge placed around the shaft of the penis consisted of three plastic filaments with different release-force constants chosen to represent intracavernosal pressures achieved during erection. The filaments remained unbroken (indicating no or minimal erection), or up to all three could be broken (signifying that an erection occurred, likely to be of sufficient rigidity for intromission).<sup>18</sup>

Impaired blood flow to arteries of the penis was indicated

by decreased systolic pressure in the penile arteries compared with the brachial artery pressure, expressed as a ratio, the penile-brachial index. A digital blood pressure cuff was placed around the base of the penis and systolic pressure recorded by Doppler technique. An index of less than 0.75 may be associated with bilateral aortoiliac occlusions on angiographic studies and is "suggestive" of a vascular factor contributing to erectile dysfunction, while 0.6 or less is highly correlated with angiographic lesions and has been called "diagnostic" of vasculogenic impotence.<sup>19</sup> Men with such impaired vascular function rarely reported any sexual activity. The index was repeated after treadmill exercise in 54 of the men with no recent history of angina or myocardial infarction, since it is believed that some men with pelvic vascular disease may experience an external iliac "steal syndrome" (with early loss of erection after the onset of coital thrusting) yet have normal indices at rest.<sup>20,21</sup> A drop of at least 0.15 in the penile-brachial index after exercise was used to detect this loss of flow from the penile to gluteal and femoral regions.

The bulbocavernosus reflex latency time (recorded by the electromyographic response in the bulbocavernosus muscle after electrical stimulation by a ring electrode around the glans) was measured to test the reflex arc through the pudendal nerve and sacral erection center. The normal latency time is <42.5 ms.<sup>22</sup> Peripheral nerve sensory latencies and motor conduction velocities were also done.

## Results

The results of the interview characterized the veterans and their sexual problems. The initial 93 men evaluated ranged in age from 50 to 80 years old with a mean (and median) of  $61 \pm 6$  SD (standard deviation) years. Of the men, 91% had a steady sexual partner. A sexual problem had been apparent from four months to 20 years before presentation, with a mean of  $4.5 \pm 4$  years. All described normal previous sexual function. At presentation, 42 men (45%) reported the inability to obtain any degree of erection under any circumstance; 47 (51%) had difficulty obtaining erections and achieved only weak, partial erections inadequate for vaginal intromission; 4 (4%) described the problem as rapidly losing a firm erection (premature erectile loss). Most subjects retained the ability to ejaculate without an erection.

The Derogatis Sexual Functioning Inventory is a self-report psychological inventory that contains ten subsets designed to measure several dimensions of sexual functioning. The subjects of this study were considerably older, of different social backgrounds and had more medical disease than the group on which the inventory was standardized. They scored below the thirtieth percentile on the nine distinct subtests: Information (below the thirtieth percentile), indicating less understanding of fundamental facts of anatomy, physiology and general hygiene regarding sexual functions; Experience (below the twentieth percentile), indicating constriction of sexual behavior and variety of sexual experiences; Drive (below the thirtieth percentile), indicating reduced level of interest or investment in sexual matters; Attitudes (fifteenth percentile), indicating more inhibitions, negative emotions and reduced communications; Symptoms (below the fifteenth percentile), indicating numerous somatic symptoms and high intensity of distress; Role (below seventh percentile), indicating imbalance of sex role characteristic in

the direction of hypermasculinity; Fantasy (twentieth percentile), indicating constriction in the variety of sexual fantasies; Body (below the tenth percentile), indicating dissatisfaction with own physical attractiveness and body image, and Satisfaction (below the thirtieth percentile), indicating a low degree of sexual satisfaction.

The tenth measure "Affect" is often used as a separate psychometric instrument, the Affects Balance Scale<sup>23</sup> measuring the balance between positive affects (joy, contentment, vigor, affection) and negative affects (anxiety, depression, guilt, hostility). On this scale, the subjects' mean score was just below the fortieth percentile, indicating a tendency towards negative affects. Only two men, however, had scores that were two standard deviations or more below the mean, indicating severe imbalance toward negative emotions.

On the two global indices of sexual functioning, our sample as a group scored much lower than the norm group as follows: below the second percentile on the Sexual Functioning Index and at the twentieth percentile on the Global Sexual Satisfaction Index. The global scores indicate that our subjects had serious deficiencies across the board in all important aspects of sexual function as measured by a summation of all the subtests of the inventory (Sexual Function Index) and by the subjects' conscious evaluation (Global Sexual Satisfaction Index) of their current level of sexual functioning.

NPT monitoring was completed in 70 of the 93 men. Sixty-four of these 70 men (91%) registered no nocturnal erections that could be considered adequate for vaginal penetration by rigidity criteria (broken snap-gauge filaments or observation), suggesting an organic cause. Only six men broke all the snap-gauge filaments on at least one monitored night, indicating a firm erection probably sufficient for penetration but of undocumented duration. All of the men tested who reported absent erections under all circumstances had abnormal findings on NPT (30/30). Of the 47 men complaining of weak erections 32/37 studied had abnormal NPT results while 5 broke all the filaments of the gauges. Two of three complaining of firm but short-lasting erections had abnormal results on NPT. Thus in most cases the NPT monitoring confirmed the clinical history.

In all, 24% of those undergoing vascular testing (21 of 86 men) had resting penile-brachial pressure indices suggestive of aortoiliac disease ( $<0.75$  but  $>0.6$ ) and an additional 13 (15%) had indices considered diagnostic of vasculogenic impotence ( $\leq 0.6$ ) (Table 1). Of these 13 men, 8 had evidence of other atherosclerotic disease and 7 were diabetic. Disease of more distal vessels (such as the internal pudendal arteries, dorsal and deep penile and bulbourethral arteries) might not be detected by the resting penile index and impairment of the vastly increased flow to the cavernous bodies required during erection may occur without affecting resting measurements. Fifty-four men agreed to exercise on a treadmill and 8 of these had a fall in the index of  $\geq 0.15$  after exercise, consistent with the pelvic steal syndrome. Five of these men also gave a history of other atherosclerotic disease and three had diabetes.

The men were found to have a high incidence of nerve pathology, either pelvic or peripheral. Of 87 men who consented to neurologic studies, the bulbocavernosus reflex was absent in 13 men and the latency time was prolonged ( $>42.5$  ms) in 3 others. Overall, 54% of the 87 men who underwent evaluation of the bulbocavernosus reflex latency time, periph-

TABLE 1.—Penile-Brachial Pressure Index in Subjects With Abnormal Results

Patient Number	Supine		Postexercise	
	Right	Left	Right	Left
5	0.67	0.67	...	...
6	0.39	0.33	0.50	0.45
7	0.81	0.69	0.68	0.55
13	0.65	0.82	0.80	0.87
16	0.62	0.82	...	...
18	0.57	0.57	1.00	1.00
21	0.40	0.40	0.21	0.17
28	0.69	0.69	0.60	0.67
31	0.60	0.80	0.67	0.83
33	0.65	0.71	0.67	0.73
36	0.73	0.51	0.46	0.42
39	0.57	0.50	0.66	0.66
41	0.69	0.69	0.27	0.27
42	0.80	0.67	...	...
43	0.75	0.67	0.85	0.77
44	0.71	0.79	0.60	0.60
47	0.69	0.65	0.27	0.40
50	0.53	0.73	...	...
51	0.58	0.58	...	...
54	0.62	0.77	...	0.69
59	0.62	0.77	...	...
62	0.69	0.75	...	...
65	0.56	0.63	0.67	0.53
66	0.67	0.69	0.69	0.65
67	0.59	0.65	0.89	0.78
69	0.85	0.69	0.86	0.71
73	0.62	0.77	0.71	0.86
75	0.58	0.77	0.47	0.60
76	0.62	0.57	0.81	0.68
79	0.55	0.55	...	...
80	0.67	0.74	...	...
88	0.73	0.73	...	...
89	0.69	0.77	0.78	0.93
91	0.69	0.75	...	...

eral nerve sensory latencies and motor conduction velocities had abnormal findings on conduction tests. Neuropathy was more prevalent among the diabetic men; 43% of the nondiabetic men and 90% of the diabetic men had abnormalities on the tests.

The most common endocrinopathy discovered by history or hormonal studies was diabetes mellitus. In this group of men, 21 patients had a history of diabetes mellitus. All had abnormal results on NPT. There were nonsignificant trends towards younger age (59.6 versus 61.9 years) and more obesity (mean percent of ideal body weight, 124% versus 117%) in the diabetic men. However, their incidence of atherosclerotic diseases by history and abnormalities on vascular and neurologic testing was no different from the nondiabetic men. There was also no difference in the hormonal values. The only difference was the more common finding of neurologic disease ( $P < .001$ ). Two additional men were found to have hypothyroidism.

A tentative diagnosis of hypogonadism, as defined by a mean testosterone value more than 2 SD below the mean of healthy adult men of all ages, was made in four men (Table 2). None of these four had gonadotropin elevation. Three had

TABLE 2.—Endocrine Data

Patient #	Age yrs	IBW %	T ng/dl	FT ng/dl	E <sub>1</sub> pg/ml	E <sub>2</sub> pg/ml	FE <sub>2</sub> pg/ml	LH mIU/ml	FSH mIU/ml	PRL mIU/ml	Patient #	Age yrs	IBW %	T ng/dl	FT ng/dl	E <sub>1</sub> pg/ml	E <sub>2</sub> pg/ml	FE <sub>2</sub> pg/ml	LH mIU/ml	FSH mIU/ml	PRL mIU/ml
1...	56	116	82	1.5	32	17	5.7	6.8	4.7	46.0	48...	55	122	480	18.9	40	53	30.7	7.4	5.6	18.9
2...	66	135	121	2.4	49	22	8.0	10.4	31.0	370.0	49...	58	126	490	12.6	46	34	15.3	7.2	8.0	11.1
3...	63	115	232	10.1	52	22	14.0	8.8	7.6	55.0	50...	55	139	496	10.9	42	33	14.4	7.8	25.2	10.3
4...	63	161	245	12.9	43	33	23.4	8.5	8.9	9.2	51...	56	89	500	8.1	57	14	3.4	9.8	14.4	7.1
5...	71	117	254	7.8	51	40	26.2	15.0	11.1	11.0	52...	67	116	520	11.9	44	30	10.4	13.3	11.8	7.3
6...	60	100	258	8.9	48	31	15.5	7.6	10.2	7.1	53...	67	112	525	13.5	36	26	11.0	12.4	18.8	22.8
7...	69	127	259	6.5	52	36	15.9	14.9	10.0	7.0	54...	65	109	547	12.6	42	40	20.6	12.2	2.0	7.8
8...	71	117	260	8.3	48	84	30.5	10.5	12.0	7.8	55...	55	114	550	12.1	55	36	13.4	10.3	37.7	7.6
9...	59	103	273	8.5	49	38	24.8	7.1	3.7	5.5	56...	58	102	555	17.1	80	110	56.4	5.6	6.1	7.1
10...	64	136	278	8.7	53	37	23.2	27.0	60.1	9.9	57...	72	104	555	11.1	50	45	23.0	10.2	9.9	8.4
11...	62	122	295	14.4	52	33	19.0	9.6	13.2	8.6	58...	53	123	560	16.7	48	54	27.5	9.8	5.5	5.7
12...	62	131	299	9.6	68	33	16.6	8.2	4.5	8.0	59...	59	115	560	12.8	58	57	27.2	7.0	4.5	13.7
13...	63	146	306	12.6	71	57	32.9	8.3	12.3	5.9	60...	66	120	575	16.7	45	56	38.3	8.3	7.6	9.3
14...	66	139	308	9.1	34	34	15.0	10.0	18.5	7.8	61...	80	104	585	12.0	52	33	10.0	12.0	16.0	6.4
15...	52	144	313	12.1	36	51	31.9	6.9	6.8	10.3	62...	58	117	586	15.0	59	59	34.4	19.9	9.3	8.7
16...	54	100	314	3.6	33	34	9.5	26.0	124.0	7.2	63...	56	115	587	14.1	31	62	34.5	24.5	18.0	9.3
17...	64	108	315	10.8	68	36	22.8	11.4	6.7	5.5	64...	67	94	590	11.6	34	26	8.7	8.1	5.9	12.0
18...	61	140	317	12.2	44	49	31.5	18.3	32.5	9.7	65...	57	108	593	24.9	54	15	8.9	15.2	26.8	7.2
19...	64	135	320	9.7	90	68	36.9	7.2	10.5	7.0	66...	60	123	600	13.7	111	58	26.8	9.5	9.0	7.3
20...	70	114	340	7.9	53	36	14.9	12.4	17.0	8.8	67...	67	106	615	9.6	31	38	12.7	7.3	3.5	5.2
21...	63	115	354	12.2	44	23	12.7	11.5	13.3	10.8	68...	64	120	630	15.5	56	27	10.8	11.5	48.0	8.4
22...	65	102	361	9.6	48	26	14.3	9.3	7.5	6.8	69...	55	101	630	16.3	44	44	18.6	12.0	12.0	7.9
23...	61	114	365	10.5	72	48	22.4	9.8	7.8	12.8	70...	65	106	650	15.2	58	27	9.9	11.5	10.7	12.0
24...	50	133	370	12.4	53	26	13.5	10.5	2.6	8.3	71...	57	133	653	15.9	40	65	28.1	21.0	44.2	11.9
25...	61	132	376	10.3	83	41	20.7	6.3	3.5	9.0	72...	65	101	656	14.5	70	39	21.3	16.0	10.0	5.6
26...	54	114	380	15.4	31	38	21.8	8.5	10.8	13.9	73...	56	131	665	23.9	56	60	39.3	8.3	8.1	13.2
27...	57	147	386	12.0	50	48	24.6	7.3	10.8	7.1	74...	57	102	690	23.1	112	37	22.7	6.0	13.2	14.3
28...	63	136	391	9.3	60	34	13.9	9.2	10.2	32.5	75...	53	100	695	15.6	80	43	15.8	19.0	25.5	5.8
29...	64	131	392	10.6	58	49	24.8	9.4	5.4	12.7	76...	53	124	700	26.3	55	54	37.3	12.8	14.5	8.8
30...	60	109	400	17.3	46	22	14.3	13.3	15.7	18.4	77...	68	112	705	10.5	61	66	20.0	8.3	9.1	8.9
31...	62	108	400	13.7	37	59	31.6	4.9	3.6	5.9	78...	63	139	720	19.3	85	97	29.3	12.5	20.7	13.5
32...	69	105	412	10.5	54	24	13.3	5.2	4.1	6.7	79...	63	101	730	8.4	44	35	8.4	10.3	12.1	5.8
33...	68	145	418	14.2	40	41	27.0	15.5	18.6	9.7	80...	71	105	737	12.8	53	25	9.0	8.7	7.1	15.6
34...	64	147	418	8.0	48	56	24.7	6.3	7.1	11.6	81...	61	104	740	14.3	55	54	18.0	15.3	20.5	10.4
35...	71	132	418	11.1	66	80	49.6	18.0	18.0	11.6	82...	54	97	744	20.0	62	51	25.1	6.1	9.4	8.5
36...	50	135	420	12.3	183	92	36.0	10.5	5.2	14.0	83...	55	132	750	18.2	30	36	15.1	10.0	11.5	6.1
37...	56	137	425	12.1	30	44	25.5	5.0	5.4	9.8	84...	62	117	760	18.6	113	125	58.8	13.2	13.6	14.5
38...	65	108	426	11.9	83	62	35.3	6.3	7.1	4.8	85...	50	95	770	16.1	49	45	17.2	8.7	3.0	24.8
39...	66	125	429	15.2	57	62	36.6	12.2	9.4	7.0	86...	55	105	780	23.0	64	40	23.7	9.5	14.5	7.4
40...	60	115	433	11.8	59	32	13.5	16.7	26.7	18.5	87...	61	108	790	19.0	53	33	19.8	5.2	5.1	5.7
41...	62	117	435	11.0	53	21	13.3	20.0	5.7	8.9	88...	55	106	792	14.4	48	54	27.3	6.8	6.4	4.8
42...	66	124	445	12.9	64	42	14.8	8.7	5.3	6.0	89...	52	111	807	21.4	67	43	23.4	12.5	26.0	9.4
43...	61	117	450	13.3	34	39	23.1	9.1	10.2	8.7	90...	61	121	810	19.7	51	40	21.0	9.3	8.8	9.5
44...	56	104	450	13.7	30	28	18.2	13.5	8.6	2.9	91...	62	109	857	13.4	53	53	24.4	6.4	5.2	3.1
45...	72	135	452	10.5	43	43	17.6	12.4	6.8	13.8	92...	63	94	923	19.5	62	68	33.4	12.9	13.3	6.8
46...	69	124	460	12.7	78	31	13.1	9.3	12.3	13.6	93...	63	127	960	26.2	126	112	60.1	15.0	23.5	13.4
47...	55	115	468	9.2	36	36	15.8	10.1	4.7	4.5											

PRL = prolactin

FSH = follicle stimulating hormone

LH = luteinizing hormone

FE<sub>2</sub> = free estradiolE<sub>2</sub> = estradiolE<sub>1</sub> = estrone

FT = free thyroxine

T = testosterone

IBW = ideal body weight

hyperprolactinemia; one had a nonsecreting pituitary tumor, another a prolactinoma and the third idiopathic hyperprolactinemia. The fourth man was felt to be eugonadal with decreased testosterone levels due to obesity (161 % of ideal body weight) reflected in decreased SHBG capacity, normal free thyroxine values, normal gonadotropins and prolactin. In all, 25 men had testosterone values between 250 and 400 ng per dl (more than 1 SD below the laboratory mean but not 2 SD below). Four of these men with borderline total testosterone levels had abnormal free thyroxine values ( $<8$  ng per dl). One also had clearly elevated gonadotropin levels and the diagnosis was probable primary hypogonadism. The other three had luteinizing hormone levels at the upper limit of normal and, along with two additional patients with high luteinizing hormone levels and free thyroxine values at the lower limit of normal, were given a working diagnosis of primary hypogonadism. The question of secondary hypogonadism due to a central or pituitary lesion in the remaining 19 men with borderline testosterone and normal luteinizing hormone values could be raised and would be difficult to detect by static hormonal tests.

Normal testosterone and free thyroxine levels were noted in 64 men. While their mean gonadotropin levels were normal, 11 of these "eugonadal" subjects had luteinizing hormone elevations in the pooled serum. The lack of utility of baseline gonadotropin values as a measure of effect of the steroid at target tissues to improve the diagnostic criteria for

hypogonadism in the older subjects with borderline or normal testosterone values is shown in Figure 1, where testosterone, free thyroxine and estradiol levels were plotted against luteinizing hormone and testosterone plotted against follicle-stimulating hormone for the entire group. No relationship between the steroid hormones and gonadotropins was seen.

The interrelationships between the various hormonal measurements were statistically evaluated. Even after excluding the three men with hyperprolactinemia, there was a paucity of hormonal interrelationships. The only significant correlations found were expected, positive between testosterone and free thyroxine ( $r=0.7142$ ,  $P<.001$ ), testosterone and estradiol ( $r=0.320$ ,  $P<.005$ ), free estradiol and ideal body weight ( $r=0.2429$ ,  $P<.02$ ) and estradiol and estrone ( $r=0.5398$ ,  $P<.001$ ). Additionally age was inversely correlated with free thyroxine ( $r=-0.3353$ ,  $P<.001$ ) and percent of ideal body weight was inversely correlated with testosterone ( $r=-0.3774$ ,  $P<.001$ ) and with the SHBG capacity ( $r=-0.315$ ,  $P<.005$ ), but not free thyroxine.

Recent reports suggesting a relationship between atherosclerotic heart disease and serum estrogen levels<sup>24</sup> and diabetes and estrogen elevation<sup>25</sup> led us to evaluate subsets with high (more than 2 SD above the mean of normal men, estradiol  $\geq 50$  pg per ml or estrone  $\geq 60$  pg per ml) versus low or normal (estradiol  $<50$  pg per ml and estrone  $<60$  pg per ml) estrogen groups. In this limited series there was no difference in the prevalence of coronary, cerebral or peripheral athero-

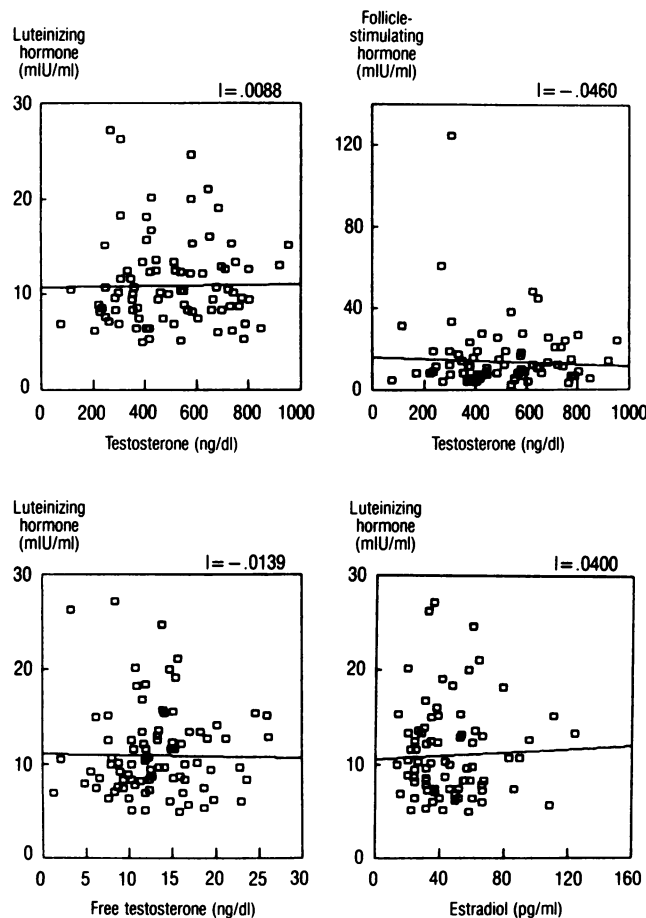


Figure 1.—Lack of relation between the steroid hormones and gonadotropins.

sclerosis or penile vascular insufficiency on Doppler examination among those older men with the higher estradiol values when compared by  $\chi^2$  tests with the men with lower values. The estrogen levels in those with diabetes ( $n=21$ ) compared with the rest ( $n=72$ ) were not significantly different by  $t$  test, although both groups with erectile dysfunction had a similar high incidence of hypertension and atherosclerotic disease.

Potential organic etiologic factors were numerous. More than 90% of the men had at least one coexisting medical condition felt to be pertinent to their impotence. The majority (67%) took medications known to contribute to sexual dysfunction. Diuretics (used by 32 men) and  $\beta$ -blockers (by 18 men) were the most common. Hypertension and atherosclerotic diseases (including a history of myocardial infarction, angina, stroke or peripheral vascular disease) were also highly prevalent, seen in 51% and 42% of the subjects, respectively. Recent or past alcohol intake of six or more ounces of spirits per day was reported by 19 (20%). Stressful factors (such as marital or family problems) or psychologic disorders were elicited in 14 (15%). Three were in therapy and receiving psychoactive drugs. Earlier pelvic surgical procedures were common, consisting of fairly recent transurethral prostatectomies in 18 (19%), old vasectomies in 28 (30%) and a scattering of colonic and prostate resections and arterial bypass grafts. Three men had Peyronie's disease and six were found to have hydroceles or prior repair.

## Discussion

Erectile dysfunction is a devastating problem for an affected man and his sexual partner. Since antiquity it has been a matter of concern for physicians and other health practitioners. Recently an entire sex therapy industry has developed based on the concepts from the studies of Masters and Johnson,<sup>11</sup> suggesting that 90% of sexual dysfunction in otherwise healthy men was of psychological origin and readily treated. We were not convinced that this was applicable to the older veterans we encountered, and in agreement with three other groups<sup>6,8,10</sup> we have found various organic factors in the careful evaluation of the sexual dysfunction in over 90% of our cases.

In this series, the absence of NPT in 64 of the 70 men tested added an objective measure of erectile function to the historical evidence favoring organic factors in their sexual dysfunction. Although the absence of NPT suggests an organic basis, its presence does not mean that erections during intercourse may not be impaired.<sup>26,27</sup> Normal snap-gauge results may also be obtained in men with abnormal erections of short duration. On the other hand, there is recent evidence that NPT may be abnormal in hypogonadism at a time when erections related to erotic stimuli are normal.<sup>28,29</sup>

The Derogatis inventory confirmed poor sexual functioning and dissatisfaction, although the low scores may also be explained by the fact that the tests were not standardized on elderly men with medical disorders. In spite of these deficiencies it must be noted that most of the men did not appear seriously depressed or anxious. Psychosocial stresses were identified by history in 14 of the men; however, 8 of the 10 tested had abnormal NPT, 4 of the 11 who were not in therapy and not receiving psychoactive drugs had penile blood pressure indices suspicious for vascular disease and 8 of the 14 had neuropathy. Thus, the existence of psychosocial prob-

lems does not eliminate the need to define other factors, particularly in this age group.

It is apparent that problems remain with the diagnostic evaluation for erectile dysfunction. The measurement of NPT is not a completely accurate discriminator of organic versus psychogenic disorders although it has been useful in demonstrating normal erectile capacity to patients with isolated psychogenic factors and for encouraging their participation in sexual and marital counseling or behavior modification therapies. There is presently no gold standard for evaluation of the neural role in erectile dysfunction (whether structural or neurotransmitter abnormalities are proposed). The peripheral neuropathies and absent or delayed bulbocavernosus reflexes identified in this study suggest a potential neurogenic contribution to impotence, although admittedly bulbocavernosus reflexes have not been adequately studied in the select subset of elderly men with normal erectile function, and the other peripheral sensory nerves tested play no direct role in the mechanism of erection. Clinical testing of peripheral nerve function at best correlates with general autonomic neuropathy.

While more data are available on the evaluation of penile arterial flow, the "gold standard" of pudendal arteriography is not likely to be applied as part of the impotence workup until vascular microsurgical repair becomes available as a therapeutic option. At present, there is correlation between the penile-brachial index and pudendal arteriography in that severely impaired dorsal artery flow measured by the noninvasive Doppler examination is likely to indicate a vasculogenic cause. The pressure indices may be most diagnostic when very low, indicating abnormal penile vasculature, but less helpful when normal. However, the absence of good direct cavernosal artery measurements means that much vascular disease may still go undetected.

The same conclusion may be drawn from the results of endocrinologic measurements. Obvious primary or secondary hypogonadism or hypothyroidism may be uncovered in a small subgroup of the patients. A specific role for endocrinopathy was found in only two new cases of hypothyroidism and four men with definite hypogonadism. Five additional cases of probable primary hypogonadism were found among the men with borderline testosterone. Luteinizing hormone elevation may give a clue to deficient androgen action at the tissue level; however, increasing levels with age have been reported.<sup>30,31</sup> Better interpretation of testosterone levels in impotence may require longitudinal studies of individual subjects' values before and after the development of impotence. Cross-sectional hormonal measurements in groups of men carefully matched for age, weight, health status, partner availability and so forth—and only differing in sexual function—are as yet unavailable.

Because there was a large degree of subject self-selection in the clinic, the incidence of hypogonadism in the general population of men with erectile dysfunction remains unknown. It is widely believed that men with androgen deficiency lack both libido and erectile function while those with other (vascular or neuropathic) etiologies usually maintain normal sexual desire while developing difficulty with erection. Patients with continued desire may be more likely to seek medical attention for their erectile disorders than those

who have lost interest in sex. Thus while endocrine disorders such as androgen deficiency and hyperprolactinemia are certainly important and reversible causes of sexual dysfunction, hypogonadism was not a frequent finding in these veterans seeking consultation specifically for sexual dysfunction. They are more likely to be detected by a primary care physician who routinely questions all patients about sexual function. Sexual dysfunction uncovered in this fashion, even (especially) in men with decreased libido, deserves systematic assessment of thyroid function, sex steroids values and prolactin levels.

The lack of relation of estrone or estradiol levels to any other measurements tended to rule out consideration of estrogen excess as a major contributor to sexual dysfunction in this group.

While excellent standards are lacking for the various diagnostic measures and potent elderly controls are needed, nevertheless, early descriptive studies as this show that older men with erectile dysfunction deserve careful interviews and examinations which may indicate the need for further physiologic tests and in some cases more etiology-specific therapy. It is crucial that physicians (generalists, internists, urologists, endocrinologists and vascular surgeons) be aware of the possible relationship between the many organic disorders they may be treating and sexual dysfunction. They must question their patients about erectile function, attempt to identify the specific pathologic condition and make an effort to find and treat the treatable organic factors as well as the psychosocial.

When the high incidence of organic impotence is explained to an older couple they may be relieved of the burden of thinking that their sexual dysfunction must have emotional causes. Further study of pathogenesis of sexual dysfunction is destined to provide substantial relief to the millions adversely affected by this syndrome.

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